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ABSTRACT

This document presents data from a variety of secondary sources in an attempt to document that alcohol abuse is a serious problem in North Carolina, resulting in sickness, medical care use, death, and substantial economic costs. The primary source of data presented in this report is the Medical Examiner data system, which contains information for approximately 15% of all deaths in North Carolina each year, including all accidental and violent deaths. Because results from blood alcohol tests are included for approximately 80% of these deaths investigated by the Medical Examiner, a major section of this report examines alcohol-related mortality using this data source. The report contains a review of data on alcohol-related morbidity in North Carolina, an examination of alcohol-related mortality, and a discussion of results. Tables and discussions are included in the areas of: (1) primary alcohol diagnoses; (2) variation in the risk of hospitalization among age and race-sex groups; (3) patients treated in the mental health care system for a primary alcohol diagnosis by age and race-sex groups; (4) deaths with alcohol underlying causes by major diagnosis categories; (5) alcohol-related deaths for the 1980-1984 period by age and race-sex groups; (6) average blood alcohol percentages for number of drinks and body weight; and (7) percent of deaths with a blood alcohol level of intoxication. (NB)

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ALCOHOL-RELATED MORBIDITY AND MORTALITY IN NORTH CAROLINA

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INTRODUCTION

Social and economic development and the advent of scientific medicine in the twentieth century have resulted in great progress in the conquest of infectious diseases. Reflecting increased affluence, alterations in life style, and other developmental changes, the addictive use of tobacco, alcohol, and other substances has made drug abuse the leading cause of death in the United States. "This striking fact, however, has been obscured in the nation's vital records and statistics by the general practice of certifying and coding addictive disease deaths according to their numerous anatomic and disease manifestations, while failing to note the addictive practices underlying such precocious deaths" (1). Ravenholt estimates that nearly one-third of all deaths in the United States in 1980 were attributable to the abuse of addictive substances: about 25 percent from tobacco, 5 percent from alcohol, and 2 percent from other substances (1). Another source estimates that as much as 10 percent of all deaths in the United States are alcohol-related (2).

At present it is not possible to accurately quantify the impact on mortality of the smoking of tobacco. Diagnoses indicating tobacco dependence as a contributing cause of death are extremely under-reported on death certificates, with only three percent of 1985 North Carolina lung cancer deaths and less than one percent of total deaths having the ICD-9 diagnosis code 305.1 recorded. Should information from a revised death certificate with a smoking check-box or from some other source become available, this relationship would certainly warrant further investigation. We are fortunate, however, to have several sources of data that can be used to document the health effects of alcohol use. Primary among these is the Medical Examiner data system, which contains information for approximately 15 percent of all deaths in North Carolina each year, including all accidental and violent deaths. Results from blood alcohol tests are included for around 80 percent of these deaths investigated by the Medical Examiner. Thus a major section of this report will look at alcohol-related mortality using this data source.

The method of this study is descriptive, using data from a variety of secondary sources. After a review of data on alcohol-related morbidity in North Carolina, the question of alcohol-related mortality is considered. Finally a discussion of the results is presented.

ALCOHOL-RELATED MORBIDITY

"Life used to be simpler when we believed that all alcohol consumption was bad. Our upbringing indicated that increased consumption was not only detrimental to health but was linked to weak moral character" (3). In fact, recent evidence indicates that moderate alcohol consumption may be related to health benefits, particularly in terms of reducing susceptibility to coronary heart disease (3,4), and perhaps more generally as an occasional buffer against the harsher vicissitudes of life. In this regard, alcohol consumption is different from tobacco use, where there is no safe lower threshold (1). Of course, many people do not succeed in containing their alcohol consumption within safe limits, and the negative health consequences of excessive alcohol consumption, with which this report is concerned, are serious and widespread.

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Estimates of the prevalence of alcoholism in the general population vary considerably from one source to another, but at least two percent of the total population is probably reasonable for many cultures (5,6). This would suggest that perhaps 120,000 or more North Carolinians suffered from this disease in 1984. Data on chronic drinking from a random survey of North Carolina's population (7) show that males are roughly five times as likely as females to report that they had 60 or more drinks in the last month. Data from the North Carolina Citizen Survey for 1981 indicate that persons who are over age 50, college graduates, and have household incomes greater than $20,000 per year are much more likely to be heavy drinkers than persons in other groups.

Because of the variety of diseases to which it may contribute, excessive alcohol consumption is not always recognized as a major health problem. After heart disease and cancer, alcoholism is America's third largest health problem (8). "It contributes to morbidity in certain malignancies and to many diseases of the endocrine, cardiovascular, hematopoietic, gastrointestinal, and nervous systems" (8). The combination of alcohol and cigarettes acts synergistically in the development of cancers of the mouth, tongue, larynx, pharynx, and esophagus (8, 9). Excessive alcohol use is also a major factor contributing to accidental and violent injury and death. Alcohol abuse interacts with physiological and metabolic processes of digestion to contribute to nutrient deficiency, and has been suggested as the most common cause of vitamin and trace element deficiency in adults in the United States (10). Alcohol abuse is also a substantial risk factor in adverse fetal outcomes. Fetal alcohol syndrome is one of the leading causes of birth defects associated with mental retardation, and heavy alcohol use by pregnant women has been associated with other birth anomalies (8, 10). Estimates of the proportion of hospitalized patients who have illnesses associated with consumption of alcohol are usually in the range of one-fourth to one-third, but depend on the characteristics of the population studied (11, 12, 13).

In 1980 in North Carolina, a one-time collection of data on nonfederal general hospital inpatients was carried out, representing over 90 percent of North Carolina residents who were hospitalized during the year. Up to seven diagnostic codes were recorded for each patient, and we have selected for further analysis those patients with an alcohol-related diagnosis. Nearly 20,000 patients (after adjustment for missing data) had an alcohol-related diagnosis recorded. This was only 2-3 percent of the total 1980 general hospital discharges, however, suggesting a serious under-reporting of alcohol-related conditions on the hospital medical records. An alcohol diagnosis may in some cases be recorded on the medical record only if the person were treated in the hospital for this condition. Treatment of other diseases caused by alcohol consumption may not result in the recording of an alcohol code. Also, laboratory and other test results may not always be available in time to influence the recording of diagnoses on the medical record. Therefore, we will not use these data to indicate the absolute level of alcohol involvement in 1980 hospitalizations in North Carolina. The data are useful, however, to indicate the major medical conditions resulting from alcohol abuse and to illustrate differences in hospitalization rates among demographic subgroups.

Forty-eight percent of the discharges with a mention of an alcohol-related diagnosis on the medical record had the alcohol diagnosis as the principal diagnosis. Table 1 shows that alcohol dependence syndrome was the most common primary alcohol diagnosis, followed by alcoholic liver disease and alcoholic psychoses. The first, third, and fourth diagnoses in the table are "mental disorders" associated with alcohol abuse, and these account for 80 percent of the listed primary alcohol diagnoses.

TABLE 1

1980 N.C. Nonfederal General Hospital Discharges with a Primary Alcohol-Related Diagnosis by Major Diagnosis Categories

(N = 9497*)

Diagnosis (with ICD-9-CM code)	Percent
Alcohol Dependence Syndrome (303)	59.1
Alcoholic Liver Disease (571.0-571.3)	12.6
Alcoholic Psychoses (291)	12.1
Alcohol Abuse (305.0)	9.1
Alcoholic Gastritis (535.3)	5.1
Toxic Effect of Alcohol (980)	1.2
Other Alcohol-Related Diagnoses (425.5, 790.3, V11.3)	0.8
	100.0

*Adjusted for missing data

Next we examined the 1980 general hospital discharges with mention of an alcohol-related diagnosis code but where the primary diagnosis fell into another category. Diseases of the digestive system and injury/poisoning were the most frequent primary diagnosis categories among those discharges with a mentioned alcohol diagnosis, accounting for 21 and 16 percent, respectively, of all such diagnoses. Digestive diseases accounted for 13 percent of all 1980 hospital primary diagnoses and injuries accounted for 8 percent of the total, so we see that associated alcohol conditions are over-represented in these two groups. "Non-alcohol" mental disorders are also

relatively frequently associated with alcohol use, since these represented 11.4 percent of the primary diagnoses with an alcohol condition mentioned, but mental disorder primary diagnoses as a whole accounted for only 4 percent of total inpatient general hospital discharges in 1980.

Table 2 indicates considerable variation in the risk of hospitalization among age and race-sex groups. Persons age 45-64 are most likely to be treated in a general hospital for an alcohol-related condition. The male risk is 3 to 4 times the female risk. Nonwhite males are 29 percent more likely than white males to be hospitalized for an alcohol-related condition, while the rate for nonwhite females is 74 percent higher than the white female rate. Special attention should be paid to the Note for Table 2. Comparisons of the North Carolina data to that from a 1980 national hospital discharge survey show that North Carolina general hospital discharge rates for alcohol-related diagnoses are around one-third less than those for the United States. This could be due to economic, cultural, or religious differences between North Carolina and the nation as a whole, as well as to reporting differences in the hospital data or to differences in the proportion of alcohol problems treated in freestanding psychiatric facilities or on an outpatient basis.

TABLE 2

1980 N.C. Nonfederal General Hospital Discharges per 10,000 Population with Mention of an Alcohol-Related Diagnosis by Age and Race-Sex Groups* (N = 19334)

	Discharges per 10,000 Population
Age	
15-17	4.0
18-24	8.4
25-44	43.6
45-64	76.1
65+	41.1
Race-Sex	
White Male	48.6
White Female	12.6
Nonwhite Male	62.5
Nonwhite Female	21.9

* Note: These rates significantly understate the true involvement of alcohol in hospitalizations, due to underreporting of alcohol diagnoses on hospital records, but they do give a picture of the relative risk of alcohol-related hospitalization for age and race-sex groups. Total number of cases (N) has been adjusted for hospitals not included in the data collection.

Another source of information on alcohol-related morbidity is the North Carolina mental health statistics system. Data are collected regularly for state psychiatric hospitals, alcoholic rehabilitation centers, and area mental health programs. Like the general hospital inpatient data, however, this information covers only persons with alcohol problems who make it into the medical care system. "Mental hospital admission rates cannot be an adequate measure of the prevalence of alcoholism in the community. A large proportion of alcoholics never come to psychiatric notice ... and many die from accidents, suicide, and physical causes without their alcoholism being recognized" (5). Also, there is probably some underreporting of alcohol-related diagnoses on the records of persons who are treated in the mental health care system. Nevertheless, these data are an important source of information on the general level of use of the public mental health care system for alcohol-related problems and on differentials in use among major population subgroups.

From July 1984 through June 1985, 1140 persons with a primary diagnosis of alcohol abuse or alcohol-related disorder were served in the state's four psychiatric hospitals, representing 9 percent of all persons served. In addition, 7 percent of the persons served in the psychiatric hospitals who had a non-alcohol primary diagnosis also had an alcohol-related diagnosis mentioned on their record. There were over 3500 persons served in the four alcoholic rehabilitation centers during fiscal year 1985. In the forty-one area mental health programs in North Carolina, over 21,000 persons served in fiscal year 1985 had a primary alcohol diagnosis, which is 15 percent of the total persons served. Another 3500 persons were treated primarily for a non-alcohol diagnosis but had an alcohol-related diagnosis mentioned on their record. Counting persons who did have a primary or secondary alcohol diagnosis recorded, an estimated 30,000 persons were treated for an alcohol-related problem in fiscal year 1985 at all levels of the state-supported mental health care system. These numbers refer to treatment episodes rather than separate visits, but there is some double-counting of individuals due to program readmissions.

Table 3 shows that persons age 25-44 were most likely to be treated in the mental health care system for a primary alcohol diagnosis. For treatment in a general hospital for an alcohol-related problem, on the other hand, where negative physical consequences of drinking are likely to be involved, the age group 45-64 was shown to be at highest risk (Table 2). In Table 3 we see that males, and particularly nonwhite males, were much more likely to be treated in the mental health care system for a primary alcohol diagnosis. In terms of absolute numbers of persons served, however, white males alone accounted for 61 percent of the total.

TABLE 3

Persons Served per 10,000 Population in North Carolina Psychiatric Hospitals, Alcoholic Rehabilitation Centers, and Area Mental Health Programs During Fiscal Year 1985 with a Primary Alcohol Diagnosis by Age and Race-Sex Groups (N = 25844)

Age	Persons Served per 10,000 Population
15-17	8.4
18-24	42.8
25-44	76.5
45-64	60.2
65+	10.5
Race-Sex	
White Male	69.1
White Female	12.0
Nonwhite Male	82.6
Nonwhite Female	17.1

Further data from the mental health statistics system show that persons who were divorced or separated accounted disproportionately for the persons served for an alcohol problem. According to the 1980 census, only about 8 percent of all persons age 15 and over in North Carolina were divorced or separated at the time of enumeration, yet these two groups accounted for over 38 percent of the persons served with a primary alcohol diagnosis during fiscal year 1985. Other data indicate that persons who are divorced or separated tend to drink more heavily than those who are married or widowed (14). Fifty-three percent of the persons served for an alcohol problem had less than a high school education, which is similar to the 1980 census figure of 46 percent for all persons in North Carolina age 15 and over. College graduates, however, appear to be under-represented in psychiatric hospitals, alcoholic rehabilitation centers, and area mental health programs, since they accounted for 11 percent of the total 1980 North Carolina population age 15 and over, but represented only 3 percent of the persons served in fiscal year 1985 with a primary alcohol diagnosis. Since frequency and quantity of alcohol consumed generally increase with increasing educational attainment (14, 15), it would seem that college graduates receive a low level of alcohol treatment services through the public mental health care system relative to their need. These data exclude, however, the private alcohol and psychiatric institutions in North Carolina and college graduates are probably over-represented in those settings.

In summary, alcohol abuse is a serious problem in North Carolina that contributes substantially to physical diseases and use of general hospitals. Many persons receive treatment for alcohol problems through the mental health care system. A large proportion of alcoholics, however, go untreated until some acute medical crisis ensues.

ALCOHOL-RELATED MORTALITY

Alcohol abuse may lead to sickness, use of the medical care system, disability, and finally death. There is little information available on general morbidity due to alcohol abuse. More data exist on use of the medical care system, some of which we examined in the preceding section. Mortality reporting is very complete. In using death certificates to look at alcohol-related mortality, however, there is the problem of under-recording of alcohol diagnoses. Deaths are usually coded according to their disease manifestations and alcohol involvement is not always indicated even though alcohol use may have contributed to the death. Omission of alcohol diagnoses may occur because alcohol involvement was not readily apparent at the time of death, or because of social stigma involved in indicating alcohol use on the death certificate, which is a public document in North Carolina.

We are fortunate in North Carolina to have a data system in the Office of the Chief Medical Examiner that includes information on the decedent's blood alcohol level for most of the deaths within the Medical Examiner's jurisdiction. This system includes all of the deaths in North Carolina due to accidents and violence as well as some deaths from natural causes. We will compare the death certificate diagnoses to the Medical Examiner blood alcohol data in terms of alcohol involvement, for those causes of death for which the Medical Examiner data are complete. But first it will be useful to get a broader picture of alcohol-related mortality using the death certificates, which cover all deaths, keeping in mind that the level of alcohol involvement indicated is a minimum.

In the years 1980-1984 there were a total of 7362 North Carolina resident deaths that had any mention of an alcohol-related diagnosis on the death certificate, representing 3.0 percent of all deaths during this period. Half of those alcohol-related deaths had an alcohol diagnosis as the underlying cause of death and half had an alcohol diagnosis mentioned as a contributing factor with another cause listed as underlying. Table 4 shows the alcohol underlying causes by major diagnosis categories. Counting the 3696 deaths shown in Table 4, alcohol abuse ranked tenth in 1980-1984 as an underlying cause of death. If we add in the 3666 other deaths where alcohol was a mentioned diagnosis, alcohol abuse ranks only behind heart disease, cancer, stroke, and total accidents as a leading cause of mortality.

TABLE 4

1980-1984 North Carolina Resident Deaths with an Alcohol-Related Underlying Cause by Major Diagnosis Categories

(N = 3696)

Diagnosis (with ICD-9 code)	Percent
Alcoholic Liver Disease (571.0-571.3)	41.7
Alcohol Dependence Syndrome (303)	31.8
Accidental Poisoning by Alcohol (E860)	11.7
Alcoholic Psychoses (291)	6.7
Alcohol Abuse (305.0)	4.1
Alcoholic Cardiomyopathy (425.5)	3.4
Alcoholic Gastritis (535.3)	0.6
	100.0

The deaths where the alcohol diagnosis was mentioned, but not as the underlying cause of death, most frequently have heart disease, motor vehicle accidents, and other accidents as the underlying cause of death. Only 1.0 percent of the deaths of persons age 15 and over with heart disease as the underlying cause had an alcohol diagnosis recorded on the death certificate. For motor vehicle accidents the percent with an alcohol diagnosis mentioned was 7.8 and for other accidents (excluding alcohol poisoning) 11.6 percent. We will see from the Medical Examiner blood alcohol data, however, that the involvement of alcohol in accidents is much greater than the death certificate diagnoses indicate. The same is true for suicide and homicide, where the 1980-1984 death certificates for persons age 15 and over indicated alcohol involvement in only 5.6 and 4.2 percent, respectively, of these violent causes of death.

Alcohol abuse ranks even more strongly as a leading cause of death if "years of life lost" are considered. The median age at death for the 7362 alcohol-related deaths shown by the death certificate during 1980-1984 was 53, compared to a median age at death of 71 for deaths from all causes. Thus persons dying from alcohol abuse are losing more potentially productive years of life, on the average. Years of life lost are calculated by subtracting age at death for a person from the average life expectancy for someone in his or her race-sex group. If the person lived longer than his life expectancy then the years of life lost is zero. During 1980-1984 the 7362 alcohol-related deaths resulted in over 136,000 years of life lost to North Carolina residents. Only heart disease, cancer, and accidents accounted for more years of life lost. Alcohol-related deaths, as indicated by the death certificates, were 3 percent of all deaths during 1980-1984 but these deaths accounted for 5.5 percent of total years of life lost. There were 12.4 heart disease deaths for every alcohol-related death, but heart disease accounted for only 3.5 times as many years of life lost.

Table 5 shows alcohol-related deaths per 10,000 population for the period 1980-1984 by age and race-sex groups. Persons age 45-64 and nonwhite males are at greatest risk of death from alcohol abuse. These were also the highest risk groups for inpatient hospitalization. Nonwhite males are at a particular disadvantage with regard to alcohol-related mortality, having a death rate over two times that for white males.

TABLE 5

1980-1984 North Carolina Resident Deaths with Any Alcohol-Related Diagnosis: Average Annual Deaths per 10,000 Population by Age and Race-Sex Groups*

(N = 7362)

Age	Deaths per 10,000 Population
15-17	0.2
18-24	0.6
25-44	2.2
45-64	6.6
65+	3.9
Race-Sex	
White Male	3.1
White Female	0.7
Nonwhite Male	6.8
Nonwhite Female	1.9

*Note: These rates indicate the approximate relative risk of alcohol-related death for age and race-sex groups, but probably understate the absolute level of alcohol involvement since they are based on the death certificate diagnoses that are recorded.

North Carolina law requires that all deaths suspected to be due to a violent or traumatic injury or accident be investigated by a Medical Examiner. Medical Examiners are licensed physicians across the state who devote their time to investigating such non-natural deaths. Certain other categories of deaths also fall under the purview of the Medical Examiner, such as deaths that are medically unattended, that occur during a surgical procedure, that are due to suspicious circumstances, or where the death is sudden or not related to known previous disease. Approximately 15 percent of the deaths that occur each year in North Carolina are investigated within the Medical Examiner system. Figure 1 shows the deaths investigated by Medical Examiners from 1980 to 1984 by cause of death.

Half of these deaths were due to "natural" causes, i.e., causes not involving accident, injury, or poisoning, while the next largest categories were motor vehicle accidents, other accidents, suicide, and homicide.

A large amount of information is collected for each death investigated by a Medical Examiner, and these data are computerized at the Office of the Chief Medical Examiner in Chapel Hill. This information is compiled from a death certificate completed by the Medical Examiner, a detailed "Report of Investigation by Medical Examiner," an autopsy report if an autopsy was performed, a motor vehicle crash report (if appropriate), and the results of a variety of toxicology laboratory tests. One of the most frequent toxicology tests is a blood test for ethanol. During 1980-1984 approximately 77 percent of the deaths investigated by the Medical Examiners had a blood alcohol test. The most frequent reasons for not performing a blood alcohol test are if the decedent were very young, if the person survived for more than a few hours after the precipitating cause of death and thus would have metabolized any alcohol in the blood, or if the body had undergone advanced decomposition which would alter the test results. In determining the role of alcohol in deaths investigated by the Medical Examiners, we will be relying on the results of the blood alcohol tests.

A person is legally intoxicated in North Carolina if his blood alcohol percent is .10 or greater. This is also sometimes referred to as a level of 100 mg%. Table 6 shows an average blood alcohol percentage that would be expected given a specified number of drinks and body weight in pounds. A 180 pound person, for example, would have to consume five drinks in about an hour in order to be legally intoxicated.

TABLE 6

Approximate Blood Alcohol Percentage

Drinks	Body Weight in Pounds							
	100	120	140	160	180	200	220	240
1	.04	.03	.03	.02	.02	.02	.02	.02
2	.08	.06	.05	.05	.04	.04	.03	.03
3	.11	.09	.08	.07	.06	.06	.05	.05
4	.15	.12	.11	.09	.08	.08	.07	.06
5	.19	.16	.13	.12	.11	.09	.09	.08
6	.23	.19	.16	.14	.13	.11	.10	.09
7	.26	.22	.19	.16	.15	.13	.12	.11
8	.30	.25	.21	.19	.17	.15	.14	.13
9	.34	.28	.24	.21	.19	.17	.15	.14
10	.38	.31	.27	.23	.21	.19	.17	.16

Subtract .01% for each 40 minutes of drinking.
One drink is 1 oz. of 100 proof liquor or 12 oz. of beer.

Example: 160 lb. man takes 7 drinks in 4 hours (240 min.)
.16-.06 = .10% of blood alcohol.

Less than 10 percent of the 1980-1984 deaths due to natural causes that were investigated by the Medical Examiner and tested for blood alcohol had a level of 100 mg% or greater. But for accidental and violent causes the picture is much different. Figure 2 shows a major involvement of alcohol in deaths age 15 and over due to homicide, suicide, motor vehicle accidents, drowning, and fire. Nearly 60 percent of homicide victims who were tested had some alcohol measured in their blood and approximately 45 percent were legally intoxicated. Almost 60 percent of persons dying by fire had a blood alcohol level of 100 mg% or greater. Nearly 85 percent of the 1980-1984 deaths age 15 and over from the five causes shown in Figure 2 were tested for blood alcohol. Among these, the percents shown are based on 2692 homicides, 3270 suicides, 4795 motor vehicle accident deaths, 686 drownings, and 626 deaths by fire.

The percentages of alcohol involvement shown in Figure 2 are much higher than what would be derived from looking at alcohol diagnoses on the death certificates. For example, only 4.2 percent of the 1980-1984 death certificates for persons age 15 and over who died from homicide had any mention of an alcohol diagnosis. Direct matching of death certificate records to the Medical Examiner file for the period 1980-1983 revealed that, of all the Medical Examiner records showing a blood alcohol level of 100 mg% or greater at the time of death (all causes), only one-third of the corresponding death certificates had any mention of an alcohol diagnosis. This discrepancy could be due to several factors. Since the blood ethanol test results are usually available after the death certificate is sent to the vital records office by the Medical Examiner, in some cases the death certificate diagnoses may not be amended later to indicate alcohol as a contributing cause of death. Like other physicians, Medical Examiners may sometimes refrain from indicating alcohol involvement on the death certificate in order to protect the next of kin. Or in some instances a person could be legally intoxicated at the time of death, but the Medical Examiner deemed that the alcohol did not ***contribute*** to the death, which is usually a prerequisite for recording it on the death certificate. In any case, the death certificate diagnoses do not presently reflect the true prevalence of alcohol involvement in mortality.

Figure 3 depicts homicide deaths by means of death. Nearly 60 percent of persons killed by sharp instruments had a blood alcohol level of 100 mg% or greater, followed by about 50 percent for shotguns and 45 percent for handguns and rifles. Handguns account for approximately one-third of homicides, followed by sharp instruments and shotguns at about 15 percent each.

Figure 4 shows substantial differences in alcohol involvement in motor vehicle deaths by accident type and decedent's involvement. Over 60 percent of drivers in a single vehicle accident who died and were tested for blood alcohol had a level of 100 mg% or greater. Fifty-five

FIGURE 1

1980–84 Medical Examiner Cases
by Manner

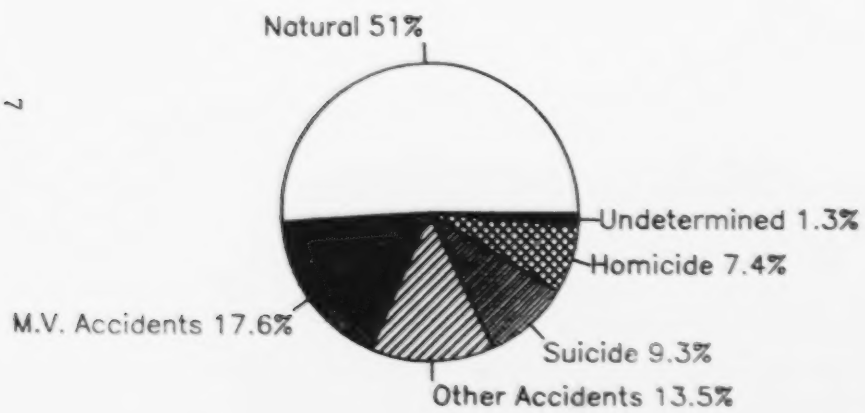


FIGURE 2

1980–84 Medical Examiner Cases 15 Years and Older
by Cause and Blood Ethanol Levels

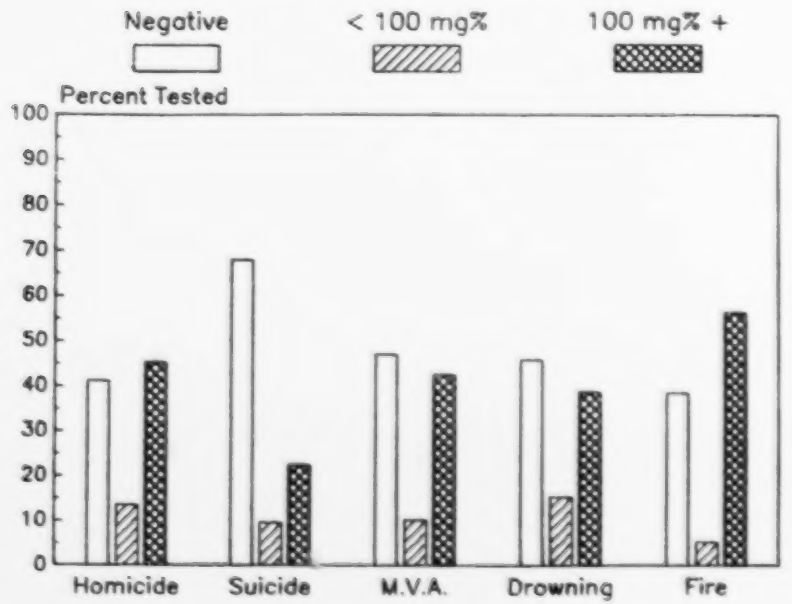
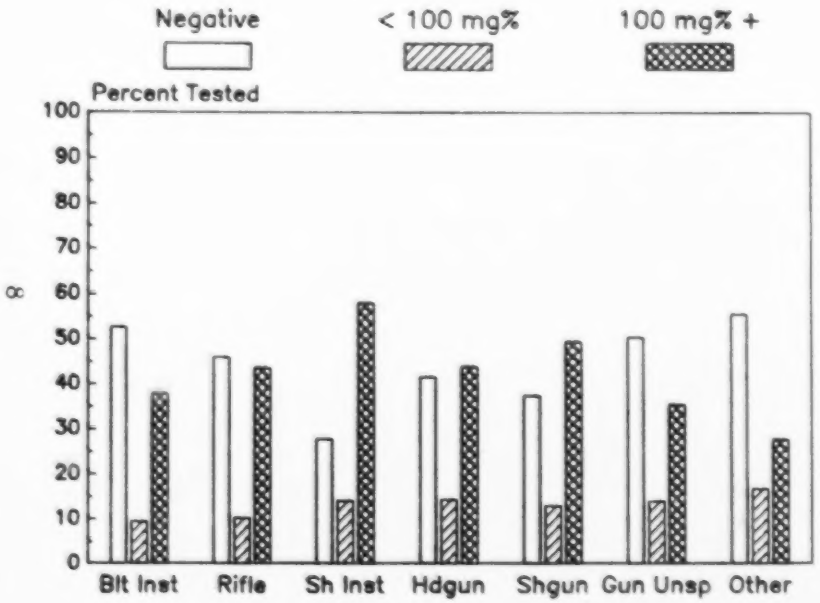


FIGURE 3

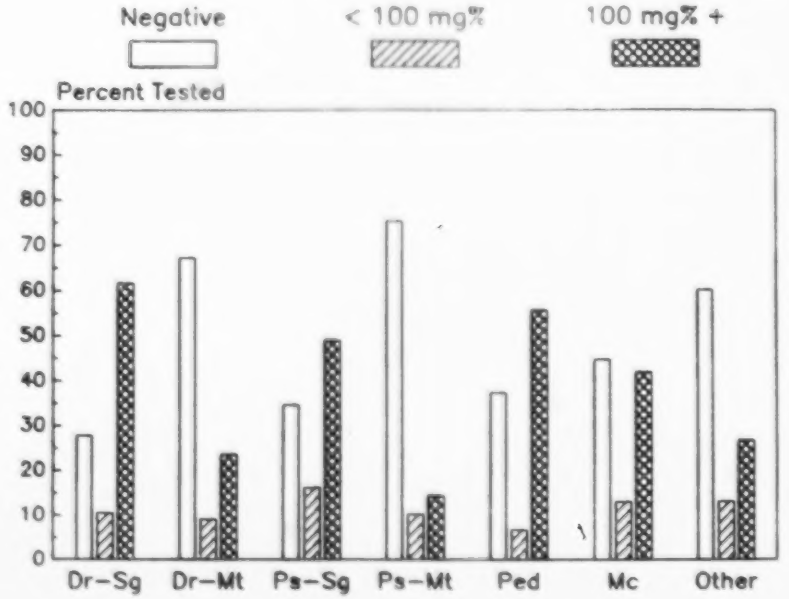
1980–84 Medical Examiner Homicide Cases 15 Years and Older
by Means and Blood Ethanol Levels



Blt Inst = Blunt Instrument
Sh Inst = Sharp Instrument
Hdgun = Handgun
Shgun = Shotgun
Gun Unsp = Gun Unspecified

FIGURE 4

1980–84 Medical Examiner M.V.A. Cases 15 Years and Older
by Involvement and Blood Ethanol Levels



Dr-Sg = Driver in a Single Vehicle Accident
Dr-Mt = Driver in a Multiple Vehicle Accident
Ps-Sg = Passenger in a Single Vehicle Accident
Ps-Mt = Passenger in a Multiple Vehicle Accident
Ped = Pedestrian
Mc = Motorcycle

percent of pedestrians killed by a motor vehicle were legally intoxicated. In 1980-1984, of the 1631 drivers and passengers killed in single or multiple car crashes who were legally intoxicated, only 9 or 0.6 percent were known to be using a seat belt or other restraint. This is even lower than the overall level of seat belt use among those who were killed in automobiles, which was 1.8 percent.

Table 7 shows percent of deaths with a blood alcohol test that had a level of 100 mg% or greater, by age and race-sex groups. For total accidents, poisoning, and violence, nonwhite males and persons age 25-44 had the highest alcohol involvement. This general pattern is also apparent for the five major causes shown, with the notable exceptions of deaths by suicide and fire, where white males had the highest levels of legal intoxication. Though not provided in Table 7 because of relatively small numbers, the Medical Examiner data show a very high involvement of alcohol in the accidental and violent deaths of American Indians in North Carolina. Over 57 percent of Indian males dying from these causes had a blood alcohol level of 100 mg% or greater, and for Indian females the percent was 38. Sixty-eight percent of Indian male homicide victims who had a blood alcohol test were legally intoxicated at the time of death.

In summary, the Medical Examiner data are a unique source of information on the contribution of alcohol to accidental and violent deaths in North Carolina. It is clear that alcohol abuse plays a major role in deaths due to these causes.

DISCUSSION

The abuse of alcohol has many negative health consequences, contributing substantially to sickness, use of medical care, and death. Perhaps one-fourth of general hospital inpatients are in the hospital because they drink the way they do. Even considering the under-reporting of alcohol-related diagnoses on death certificates, alcohol abuse still ranks as a leading cause of mortality, especially in terms of premature mortality or years of potential life lost. Chronic use of alcohol leads to many physical diseases, and these other diseases are usually recorded as the cause of death. Acute alcohol intoxication is a major contributor to injury and death from accidents and violence, as has been demonstrated from the Medical Examiner data on blood alcohol levels. Because of the chronic and hidden nature of alcohol involvement in many "natural" diseases and deaths, it may never be possible to get a true picture of alcohol-related morbidity and mortality using hospital and death records. But there certainly is room for improvement in the documentation of this important problem through hospital medical records and the certification of deaths. Physicians should take the responsibility to indicate where alcohol use is known to be an important factor in hospitalization or a significant contributing cause of death. The ICD-9 diagnosis code

TABLE 7

1980-1984 Medical Examiner Deaths Age 15 and Over Due to Non-Natural Causes that were Tested for Blood Alcohol: Percent with a Level of 100 mg% or Greater by Age and Race-Sex Groups (N = 15047)

Age	Total Accidents, Injury, and Poisoning	Homicide	Suicide	Motor Vehicle Accidents	Drowning	Fire
15-17	17.9	19.7	6.4	21.7	9.5	50.0
18-24	40.2	38.0	27.4	50.4	33.5	55.9
25-44	45.1	50.9	27.3	52.4	51.3	65.1
45-64	41.0	48.6	22.5	40.3	47.6	72.5
65+	16.3	16.9	9.2	12.6	23.6	29.2
Race-Sex						
White Male	38.0	43.6	25.1	48.1	36.8	66.3
White Female	20.5	13.8	15.4	21.3	29.5	35.0
Nonwhite Male	52.3	58.5	21.9	54.6	46.5	63.4
Nonwhite Female	30.8	30.1	7.8	26.4	18.5	34.9

790.3 is available to indicate excessive blood level of alcohol and codes 305.0 (alcohol abuse) and 303 (alcohol dependence syndrome) are more general indicators of alcohol abuse. It is likely that many cases diagnosed as cirrhosis of the liver "without mention of alcohol" are in fact alcohol-related, and further scrutiny might result in a more accurate diagnosis. Improved certification of alcohol involvement is especially important for deaths due to causes other than accidents and violence, since not all of these deaths are covered by the Medical Examiner system and there is no comprehensive source of information other than the diagnoses recorded on the death certificates.

This report has attempted to document some of the negative consequences of alcohol abuse in North Carolina in terms of increased morbidity and premature mortality. Alcohol abuse also frequently leads to job loss, reduced productivity, disability, family disruption, pain and suffering, crime, and other social problems. These problems entail large economic costs to society each year. A recent study commissioned by the Alcohol, Drug Abuse, and Mental Health Administration estimated that the total cost of alcohol abuse to the United States economy in 1980 was nearly $90 billion (16). This includes $50 billion for reduced work productivity, $14 billion present value of lost future productivity due to premature mortality, and $10 billion for direct medical treatment costs. Using the methods of this national study, total annual costs of alcohol abuse in North Carolina have been estimated at $3.8 billion.

One differential in alcohol abuse and resulting morbidity and mortality that has been identified repeatedly in this and other studies is that between males and females. The data here have shown that males in North Carolina are 3 to 4 times as likely as females to be treated in a general hospital for an alcohol-related illness, over 5 times as likely to be served in the mental health care system for an alcohol diagnosis, and approximately 4 times as likely to die with an alcohol diagnosis recorded on the death certificate. While biological factors may contribute to greater aggressiveness and related drinking behavior among males, social factors are also important. Men in our society are expected to be aggressive and competitive and such behavior is more socially acceptable for males than for females. The sex differential in alcohol consumption may be linked to underlying attitudes, such as rebelliousness and achievement striving, which are fostered to a greater extent in males than in females. Cross-cultural studies have shown that heavy use of alcohol is correlated with greater socialization pressures to achieve and with lower tolerance of dependent behavior (17). Partly as a result of high alcohol consumption men have a much higher incidence of injury and death from accidents and violence. If sex differences in drinking behavior are primarily socially determined, rather than resulting from inherent sex differences in physiology, then there may be hope for reducing disease and death from alcohol abuse among males. Changes in culturally-defined sex roles could result in behavioral modifications and less abuse of alcohol. However, the adoption of "male" behaviors by women as job participation and mobility increase and traditional roles are modified may lead to more alcohol abuse among females.

Without waiting for long-term cultural changes, other measures can be taken to reduce alcohol-related morbidity and mortality. It has been estimated that about 11 percent of our adult population consumes approximately 50 percent of all beverage alcohol retailed to consumers (15). Education and treatment efforts that target certain high-risk subgroups are more likely to be effective than less-focused mass media campaigns. Physicians and other health care providers should be more alert to the early stages of alcoholism among persons entering the health care system for other problems, and referrals for needed alcohol treatment should be made routine. Medical schools need to do more to incorporate education about the signs of alcoholism and its consequences into their curricula (18). Alcoholism treatment must be brought into the mainstream of medical practice. "Every modern medical center should have a well-organized inpatient and outpatient program for treatment of alcoholics .... Lack of such programs is a reflection of the continuing rejection of the concept of the alcoholic as a sick person rather than a sinner or an obnoxious person with a nasty vice" (8). Lack of health insurance coverage for chemical dependency treatment is also a primary reason for the large proportion of alcoholics who go untreated. Such insurance coverage is likely to be highly cost-effective since "not only does the victim of alcoholism use fewer health services of other types after treatment for alcohol abuse, but the victim's entire family also is likely to utilize other medical services less" (19). With the increase in HMO's and other prepaid health insurance plans, perhaps the early treatment of alcoholism will be better recognized as a means of preventing later, more serious medical problems.

The approaches just mentioned emphasize early intervention and treatment for persons who have already developed a drinking problem. Preventing excessive alcohol consumption in the first place presents another set of challenges. Educating people about the potential risks and dangers may not work by itself. In fact, persons at the highest educational levels are at greatest risk of alcohol abuse. Like cigarette smoking, failure to use seat belts, and other personal behaviors where the daily risk is small but the cumulative risk over a lifetime is large, alcohol overuse will be hard to prevent by only trying to change people's perceptions of their own risk. "It is not enough to tell people they are at risk and then expect them to make the necessary changes in their lives" (20). Modification of the social and economic forces that shape people's drinking behaviors must be employed as a complementary approach. One strategy would be to influence the price of alcoholic beverages. There is ample evidence that consumption of

alcohol is strongly related to its price (5, 21). Governmental measures such as increased taxation of alcoholic beverages can be effective in reducing alcohol consumption. Restriction of the hours of sale of alcoholic beverages has also been shown to have this effect (21). It has been shown that the number of alcoholics in a population is strongly related to overall alcohol consumption levels. "Since rates of alcoholism rise and fall with the overall level of alcohol use in a population, a reduction in the per capita alcohol consumption must lead to lower rates of alcoholism. For this reason the taxation of beverage alcohol and, in general, all control measures that reduce accessibility appear to be effective, particularly if there is also a wide acceptance of the public health value of such controls" (22). The principal aim of such preventive measures would be to reduce the incidence of new cases of alcoholism. Since the death rate of alcoholics from all causes is more than double that of the general population, natural attrition alone would rapidly diminish the overall prevalence of alcoholism if the inflow of new cases could be prevented (23).

Alcohol use has particularly serious consequences when combined with automobiles and firearms. Stricter enforcement of drunk-driving laws, along with stronger penalties, would prevent some injuries and deaths due to driving while intoxicated (24). Enforcement of the new seat belt law and other measures that increase seat belt use will also help. Referral of driving-under-the-influence offenders to alcohol treatment programs is another way that the legal system can help prevent alcohol-related injuries and deaths. About 70 percent of homicides and 70 percent of suicides in North Carolina are perpetrated with firearms, and we have seen the high level of alcohol involvement in these types of deaths. Stricter handgun control would make it more difficult for persons in drinking situations to employ this particularly portable and lethal form of assault. The United States is the only western nation without strong handgun laws, and in 1980 there were over 11,500 homicides using handguns in the United States, compared to less than 100 each in Great Britain, Japan, Switzerland, Sweden, Israel, Canada, and Australia (25).

Annual per capita consumption of alcohol in North Carolina has more than doubled in the last two decades (26). Use of alcohol among teenagers is widespread and increasing and generally the earlier a person starts drinking the greater the chances of developing an alcohol-related problem (27, 28). Unless strong measures are taken today to curb alcohol abuse and its consequences, these problems will likely grow worse in the future.

We have attempted to document that alcohol abuse is a serious problem in North Carolina, resulting in sickness, medical care use, death, and substantial economic costs. Better certification on hospital and death records of the contributing role of alcohol would provide a more accurate assessment of the magnitude of this problem and perhaps aid in the development of programs for treatment and prevention. Early detection and treatment of alcoholism is essential to reduce serious later consequences, and this must be accomplished by integrating these services into the mainstream of medical practice. To prevent excessive alcohol consumption in the first place, health education must be supplemented by measures that affect the social and economic factors that influence alcohol use. Alcohol-related problems are frequently hidden or denied, and it is hoped that by emphasizing the health consequences of alcohol abuse in North Carolina, this report will aid in the recognition and alleviation of these problems.

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